STAT/MA 41600
Practice Problems: September 10, 2014

1. Harmonicas. When ordering a new box of harmonicas, let X denote the time until the box arrives, and let Y denote the number of harmonicas that work properly.

Is X a continuous or discrete random variable? Why?

Is Y a continuous or discrete random variable? Why?

2. Choosing a page at random.

A student buys a brand new calculus textbook that has 1000 pages, each numbered with 3 digits, from 000 to 999. She randomly opens the book to a page and starts to read! Assume that any of the 1000 pages are equally likely to be chosen.

Let X be the page number of the chosen page. Thus, X is an integer-valued random variable between 0 and 999.

(a.) Find $P(X = 122)$.

(b.) Find $P(X = 977)$.

(c.) Find $P(X = -2)$.

(d.) Find $P(X = 1003)$.

(e.) When x is an integer between 0 and 999, find $P(X = x)$.

(f.) Find $P(X \leq 3)$.

(g.) Find $P(X \leq 122)$.

(h.) Find $P(12 \leq X \leq 17)$.

(i.) Find $P(X > 122)$.

(j.) Find $P(X = 15.73)$.

(k.) Find $P(X \leq 15.73)$.

3. Gloves. A matching pair of blue gloves, a matching pair of red gloves, and one lone white right-handed glove are in a drawer. The gloves are pulled out of the drawer, one at a time.

(a.) Suppose that a person is looking for the white glove. He repeatedly does the following: He pulls out a glove, checks the color, and if it is white, he stops. If it is not white, then he replaces the glove in the drawer and starts to check again, i.e., he reaches blindly into the drawer of 5 gloves. He continues to do this over and over until he finds the white glove, and then he stops. Let X be the number of draws that are necessary to find the white glove for the first time. For each positive integer j, find $P(X = j)$.

(b.) Now suppose that he searches for the white glove but, if he pulls a different colored glove from the drawer, he does not replace it. So he pulls out a glove, checks the color, and if it is white, he stops. If it is not white, then he *permanently discards* the glove and starts to check again, i.e., he reaches blindly into the drawer with the gloves that remain. He continues to do this over and over again until he finds the white glove, and then he stops. Let X be the number of draws that are necessary to find the white glove for the first time. For each integer j, with $1 \le j \le 5$, find $P(X = j)$.

4. Three dice. Roll three dice and let X denote the sum. For which values of j is $P(X = j)$ a strictly positive number?

5. Pick two cards. Pick two cards at random from a well-shuffled deck of 52 cards (pick them simultaneously, i.e., grab two cards at once—so they are not the same card!). There are 12 cards which are considered face cards (4 Jacks, 4 Queens, 4 Kings). Let X be the number of face cards that you get.

Find $P(X = 0)$.

Find $P(X = 1)$.

Find $P(X = 2)$.